WHAT IS CLAIMED IS:

1. A bipolar semiconductor device comprising:

a drain electrode;

a drain region having a first conductive type and disposed on the drain electrode;

a drift region having a second conductive type different from the first conductive type and disposed on the drain region;

a channel region having the second conductive type and disposed on the drift region;

a gate region provided so as to surround at least a part of the channel region via an insulation film;

a source region having the second conductive type provided on the channel region; and

a source electrode connected to the source region.

2. The semiconductor device according to claim 1, wherein:

the gate region has the first conductive type,

and a depletion layer is formed over most of the entire channel region when a predetermined voltage is applied to the gate region.

3. The semiconductor device according to claim 1, further comprising a semiconductor region having the first conductive type provided between the channel region and the source electrode.

4. The semiconductor device according to claim 2, further comprising a semiconductor region having the first conductive type provided between the channel region and the source electrode.

5. The semiconductor device according to claim 1, wherein at least a part of the source electrode forms a Schottky junction with the channel region.

6. The semiconductor device according to claim 2, wherein at least a part of the source electrode forms a Schottky junction with the channel region

7. The semiconductor device according to claim 1, further comprising a semiconductor having the second conductive type, located between the source region and the source electrode, and an end face thereof is extended to a position covering at least a portion of the gate region.

8. The semiconductor device according to claim 7, wherein a thickness of an insulating film formed on an upper portion of the gate region is thicker than a thickness of an insulating film formed on a side portion of the gate region.

9. The semiconductor device according to claim 7, further comprising an insulating film located between the semiconductor layer and the source electrode and having an opening portion for the semiconductor layer and the source electrode to contact, wherein a width of the opening portion is wider than a ~~space~~ distance of the gate region.

10. The semiconductor device according to claim 8, further comprising an insulating film located between the ~~conductive~~ semiconductor layer and the source electrode, and having an opening portion for the semiconductor layer and the source electrode to contact, wherein a width of the opening portion is wider than the ~~space~~ distance of the gate region.

11. The semiconductor device according to claim 1, wherein the source region is located substantially at a center of the channel region, and wherein the source region is isolated from the insulation film.

12. A semiconductor device comprising:

a substrate having a first conductive type;

a drift region having the first conductive type and disposed on the substrate;

a channel region having a second conductive type different from the first conductive type and provided on the drift region;

a gate region provided so as to surround the channel region via an insulation film; and

a source region having the second conductive type and provided on the channel region, wherein:

an impurity concentration in the channel region is equal to or less than an impurity concentration in the drift region, and a depletion layer forms over the entire channel region sandwiched between the gate region when a zero bias is applied to the gate region.

13. The semiconductor device according to claim 12, wherein the source region is located substantially at a center of the channel region, and wherein the source region is isolated from the insulation film.

14. A semiconductor device comprising:

a cathode region;

a channel region disposed on the cathode region;

an anode region disposed on the channel region, wherein:

an impurity concentration in the channel region is equal to or less than an impurity concentration in the cathode region.

15. The semiconductor device according to claim 14, wherein the anode includes an anode electrode that forms a Schottky junction with the channel.